

WHAT WE CLAIM IS:

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1. A belt cooling and guiding apparatus for a casting belt of a twin belt caster provided with a pair of rotatably supported endless casting belts, a casting mold formed between moving casting surfaces of confronting generally planar sections of the belts, said sections having reverse surfaces opposite said casting surfaces, the casting mold having a molten metal entrance at one end and a solidified sheet article outlet at an opposite end, and a casting injector for introduction of molten metal into the casting mold at the entrance of the casting mold; the cooling and guiding apparatus comprising at least one elongated nozzle having a support surface facing a reverse surface of said casting belt, a continuous slot in the support surface arranged transversely substantially completely across said casting belt for delivery of cooling liquid to the reverse surface of said belt in the form of a continuous film having a substantially uniform thickness and velocity of flow when considered in the transverse direction of the belt, a drainage opening for removal of cooling liquid at a position spaced from said continuous slot, and a vacuum system associated with said drainage opening for applying suction to said drainage opening.
 2. The apparatus of claim 1, wherein a first of said at least one nozzles taken in the direction of advancement of the said belt though said casting apparatus is positioned immediately adjacent to the entrance of the casting mold.
 3. The apparatus of claim 1, wherein said drainage opening is an elongated gap in the support surface arranged transversely substantially completely across said casting belt.
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4. The apparatus of claim 1, wherein the slot is of constant width along its entire length.
5. The apparatus of claim 1, wherein said slot has a width dimension in said direction of advancement of more than about 0.125 mm.
6. The apparatus of claim 1, wherein the slot has a width dimension in said direction of advancement in the range of 0.125 to 0.15 mm.
7. The apparatus of claim 1, including a filter for filtering particles from the cooling liquid liquid before said liquid passes through said slot.
8. The apparatus of claim 1, wherein the nozzle includes an elongated chamber communicating with said slot along substantially an entire length of said slot, and at least one passage for supplying said cooling liquid to said chamber.
9. The apparatus of claim 1, including at least one additional elongated nozzle provided with a support surface having an elongated continuous slot arranged transversely substantially completely across said casting belt for delivery of further cooling liquid to said reverse surface.
10. The apparatus of claim 9, having from one to three such additional nozzles arranged in succession in the direction of advancement of said belt through the casting apparatus.
11. The apparatus of claim 1, wherein said nozzle is positioned at said reverse surface immediately adjacent to said molten metal entrance of the casting mold.
12. The apparatus of claim 1, wherein said support surface includes a continuous elongated groove arranged transversely substantially completely across said one of said casting belts, said groove having a width greater than said slot, and said slot

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14. The apparatus of claim 1, wherein said support surface is beveled away from said reverse surface at outer edges of said nozzle.

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18. A twin belt caster comprising a pair of rotatably supported endless casting belts, a casting mold formed between moving casting surfaces of confronting generally planar sections of the belts, said sections having reverse surfaces opposite said casting surfaces, the casting mold having a molten metal entrance at one end and a solidified sheet article outlet at an opposite end, and a casting injector for introduction of molten metal into the casting mold at the entrance of the casting mold; said caster including cooling and guiding apparatus for at least one of said casting belts, comprising at least one nozzle having a support surface, for engaging a reverse surface of said one casting belt, provided with a continuous elongated slot arranged transversely substantially completely across said one casting belt for delivery of cooling liquid to the reverse surface of said belt in the form of a continuous film having substantially uniform thickness and velocity of flow when considered in the transverse direction of the belt, a drainage opening for removal of cooling liquid spaced from said continuous slot, and a vacuum system associated with said drainage

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Coulth opening for applying suction to said drainage opening.

19. The twin belt caster of claim 18, wherein a first of said at least one nozzles taken in the direction of advancement of the said belt though said casting apparatus is positioned immediately adjacent to the entrance of the casting mold.
20. The twin belt caster of claim 18, wherein said drainage opening is an elongated gap in the support surface arranged transversely substantially completely across said casting belt.
21. The twin belt caster of claim 18, wherein the slot is of constant width along its entire length.
22. The twin belt caster of claim 18, wherein said slot has a width dimension in said direction of advancement of more than about 0.125 mm.
23. The twin belt caster of claim 18, wherein the slot has a width dimension in said direction of advancement in the range of 0.125 to 0.15 mm.
24. The twin belt caster of claim 18, including a filter for filtering particles from the cooling liquid before said liquid passes through said slot.
25. The twin belt caster of claim 18, wherein the nozzle includes an elongated chamber communicating with said slot along substantially an entire length of said slot, and at least one passage for supplying said cooling liquid to said chamber.
26. The twin belt caster of claim 18, including at least one additional elongated nozzle provided with a support surface having an elongated continuous slot arranged transversely substantially completely across said casting belt for delivery of further cooling liquid to said reverse surface.

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27. The twin belt caster of claim 26, having from one to three such additional nozzles arranged in succession in the direction of advancement of said belt through the casting apparatus.
28. The twin belt caster of claim 18, wherein said nozzle is positioned at said reverse surface immediately adjacent to said molten metal entrance of the casting mold.
29. The twin belt caster of claim 18, wherein said support surface includes a continuous elongated groove arranged transversely substantially completely across said one of said casting belts, said groove having a width greater than said slot, and said slot having an outer end terminating in said groove.
30. The twin belt caster of claim 18, wherein said support surface is planar.
31. The twin belt caster of claim 18, wherein said support surface is beveled away from said reverse surface at outer edges of said nozzle.
32. The twin belt caster of claim 31, wherein said bevel extends inwardly from said outer edges towards said slot by a distance of from 2.5 mm to 3.5 mm.
33. The twin belt caster of claim 18, wherein said nozzle is rigidly mounted adjacent to said reverse surface.
34. The twin belt caster of claim 18, wherein an array of point cooling nozzles is provided downstream of said nozzle provided with said slot.
35. A nozzle for a belt cooling and guiding apparatus, comprising a support surface for supporting a reverse surface of a casting belt, the support surface having a length corresponding to a width of said belt, an elongated continuous slot in said support surface having a length substantially the same as the length of the support surface for delivery of cooling liquid in the form of a continuous film having uniform thickness

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and velocity of flow along the slot, and a drainage opening for removal of cooling liquid spaced from said continuous slot.

36. The nozzle of claim 35, wherein said drainage opening is an elongated gap in the support surface arranged transversely substantially completely across said casting belt.
37. The nozzle of claim 35, wherein the slot is of constant width along its entire length.
38. The nozzle of claim 35, wherein said slot has a width dimension more than about 0.125 mm.
39. The nozzle of claim 35, wherein the slot has a width dimension in the range of 0.125 to 0.15 mm.
40. The nozzle of claim 35, including an elongated chamber communicating with said slot along substantially an entire length of said slot, and at least one passage for supplying said cooling liquid to said chamber.
41. The nozzle of claim 35, including at least one additional support surface having an elongated continuous slot for delivery of further cooling liquid to said reverse surface.
42. The nozzle of claim 35, wherein said support surface includes a continuous elongated groove arranged transversely substantially completely across said one of said casting belts, said groove having a width greater than said slot, and said slot having an outer end terminating in said groove.
43. The nozzle of claim 35, wherein said support surface is planar.

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45. The nozzle of claim 44, wherein said bevel extends inwardly from said outer edges towards said slot by a distance of from 2.5 mm to 3.5 mm.

Table 1. Demographic characteristics of the study population	
Age (years)	Mean (SD)
Male	55.2 (10.5)
Female	56.8 (11.2)
Marital status	
Married	78.5%
Single	21.5%
Education level	
High school or above	65.2%
Below high school	34.8%
Occupation	
Professional	12.3%
Managerial	18.7%
Technical	25.4%
Service	32.1%
Unemployed	11.5%
Income (USD/month)	
< 1000	15.6%
1000-2000	28.9%
2000-3000	35.2%
> 3000	19.3%
Health insurance	
Yes	82.1%
No	17.9%
Comorbidities	
Hypertension	45.3%
Diabetes	22.7%
Cholesterol	38.9%
Smoking status	
Current smoker	18.4%
Former smoker	25.6%
Non-smoker	56.0%